function between the communication network 13 or the internet 15 and the transmitter etc.

Each of the wireless subscriber's terminals 12_1 to 12_N includes a sub-millimeter/millimeter wave receiver unit 51 having an antenna, a LNA and a down-link converter, an optical transmitter 52 having a lens system, a light emitting device, and an up-link converter, and a wireless MAC unit 53 having a baseband modem between the same and a user server 54. The wireless MAC unit 53 has a two-band wireless system conversion function between a giga-bit Ethernet and the optical transmitter etc.

Operation of the wireless access system of Fig. 4 will be described with reference to an example in which the user's terminal accesses one of the user servers 44_1 to 44_N through the internet 15 to receive a response packet group from the one of the user servers 14_1 to 14_N.

First, the user's terminal 58 transmits a request packet through the internet 15.

The request packet is fed to the wireless base station 11 through the internet 15 and the communication network 13.

The request packet fed to the wireless base station 11 is converted by the wireless MAC unit 57 into the frame format of the wireless-frequency-band wireless link, subjected to modulation and frequency conversion, and then transmitted to the sub-millimeter/millimeter wave transmitter unit 55.

The request packet transmitted from the sub-millimeter/millimeter wave transmitter unit 55 is received by the sub-millimeter/millimeter

wave receiver unit 51 in the wireless subscriber's terminal 12, subjected to frequency conversion and demodulation to be restored to the original request packet in the wireless MAC unit 53.

The request packet restored in the wireless subscribe terminal 12 is fed through the LAN in the subscriber to the user server 54 such as a web server or a content server.

The user server 54 targeted receives the request packet, and returns a response packet group.

The response packet group transmitted from the user server 54 arrives at the wireless subscriber's terminal 12 through the LAN in the subscriber.

The response packet group fed to the wireless subscriber's terminal 12 is converted by the wireless MAC unit 53 into the frame format of the optical wireless link, subjected to modulation to be fed to the light emitting device in the optical transmitter unit 52.

The response packet group fed from the optical transmitter unit 52 is received by the wide-angle optical sensor of the optical receiver 56 in the wireless base station 11, subjected to optical-to-electric conversion and demodulation to be restored to the original response packet group in the wireless MAC unit 57.

The response packet group thus restored to the original packet group is fed to the user's terminal 58 through the internet 15 and the communication network 13.

The above embodiments may be modified by using a known technique. For example, the sub-millimeter/millimeter wave

transmitter/receiver unit may be combined with a cellular telephone system such as PHS, GSM, CDMA-One, GRPS, W-CDMA, CDMA2000, and UMTS.

In addition, the up-link channel and the down-link channel may be reversed in their frequencies and the transmitter/receiver units. Further, both the up-link channel and the down-link channel may use different non-licensed frequencies. Further, the combination of U-NII band and ISM band of the FCC in the USA having different frequency allocation and no need to obtain a license may be combined in the present invention for the up-link channel and the down-link channel.

In the above embodiments, the combination of different frequencies assures a sufficient number of frequency bands to be obtained in either the up-link channels or the down-link channels. In particular, it is preferable that the down-link channel, such as used for passing a large-capacity data file due to the asymmetry of the traffic, use a sub-millimeter wave or millimeter wave because such a wave has a sufficient bandwidth. In this case, the up-link channel may use 2.4-GHz ISM band which does not need a license. The use of the ISM band which is exempt of the license can reduce the running costs for the access system.

A wide-band service can be obtained with a relatively low cost by combining different wireless bands such as including a 5-GHz-band which is allowed for outdoor use and a 2.4-GHz ISM band which is limited to an indoor use to obtain a sufficient number of channels. In addition, the combination of such different wireless bands simplifies the structure of the duplexer in the user's terminal.